

Claims

1. Method for continuous production of a planar thermoplastic plate material reinforced with flat fibre structures, characterised in that a first web-like fibre structure is supplied to a fibre laying device, by means of in-line fibre feed units one or more further web-like fibre structures are arranged over the first fibre structure, by means of one or more matrix feed units connected before or after the fibre feed units a matrix starting material is supplied to exposed layers of fibre structures, and the multilayer fibre web emerging from the fibre laying device and coated one or more times with intermediate layers of matrix starting material is supplied to a continuous press in which the matrix starting material is transformed under the effect of heat and/or pressure into a low viscosity fluid and the multilayer fibre web under impregnation of the fibre structure is pressed into a plate-like plastics material.
2. Method according to claim 1, wherein the matrix starting material is a reactive starting material containing cyclic or macrocyclic oligomers of polyester mixed with a polymerisation catalyst, in particular a reactive starting material containing cyclic oligomers of PBT (CPBT) mixed with a polymerisation catalyst.
3. Method according to one of claims 1 to 2, where the matrix feed units are powder scatterers by means of which the matrix starting material which is present in powder form is scattered onto a layer of an exposed fibre structure.
4. Method according to one of claims 1 to 2, where by means of a matrix feed unit a film-like matrix starting material is applied in each case to an exposed layer of a fibre structure.

5. Method according to any of claims 1 to 4, where the reactive starting material is polymerised in a continuous press into a thermoplastic plastics matrix, in particular into a PBT plastics matrix.
- 5 6. Method according to any of claims 1 to 5, where the fibre laying device contains one or more pressing stations, in particular impression cylinders, by means of which the multilayer fibre web is pre-pressed in-line.
7. Method according to any of claims 1 to 6, where the pressing station
10 comprises a contact and an impression roller which are arranged in pairs and between which the web-like fibre lay is passed during a pressing process.
8. Method according to claim 7 where the pressing station is part of a fibre
15 feed unit, where over the contact roller a web-like fibre structure is simultaneously fed, deflected and applied to the fibre web.
9. Method according to any of claims 1 to 8, where at least one fibre feed unit is formed as a cross layer by means of which a web-like flat structure,
20 supplied obliquely or diagonally in the feed direction of the fibre web, is applied onto the fibre web by regular folding thereof along the side edges of the fibre web.
10. Method according to claim 9, where the web-like flat structure is supplied
25 and folded at an angle of 45° to the advance direction of the fibre web.
11. Method according to any of claims 9 to 10, where alternately a web-like fibre structure is supplied unfolded in the advance direction of the fibre web and a subsequent web-like fibre structure is supplied by means of cross layers
30 crossing obliquely or diagonally to the feed direction of the fibre web, where the first and last fibre structures which are supplied are supplied preferably unfolded in the advance direction of the fibre web.

12. Method according to any of claims 9 to 11, where the powder scatter unit in each case is arranged after a fibre feed unit with cross layer.
- 5 13. Method according to any of claims 1 to 12, where the further fibre structures which are supplied in the advance direction of the fibre lay by way of a fibre feed unit are applied by way of a pressing station, in particular by way of a contact roller, onto the multilayer fibre web.
- 10 14. Method according to any of claims 1 to 13, where the multilayer fibre web, after supply of all fibre structures and all matrix starting materials and before entry into the continuous press, is coated on one or both sides with a cover layer in the form of a plastics foil or extruded plastics film, where in the continuous press the cover layer connects to the plastics matrix of the multilayer fibre web.
- 15 15. Method according to any of claims 1 to 14, where the cover layer is made of a thermoplastic plastics, preferably polyester such as PET, in particular a PBT or PBT plastics alloy.
- 20 16. Method according to any of claims 1 to 15, where the multilayer fibre web which is present in the form of a material laminate, in the continuous press under the supply of heat and/or pressure and under polymerisation of the plastics matrix, is connected into a thermoplastic plastics internally and pore-free into a plate- like plastics material.
- 25 17. Method according to any of claims 1 to 16, where the multilayer fibre web is guided through a continuous press with several separately adjustable pressing zones and tempering zones and the contact pressures are generated by floating hydraulically activated lower pressing plates which
- 30 work against an upper rigid pressing construction.

18. Method according to any of claims 1 to 17, where the pressure in the continuous press is created by segmented pressure plates with adjustable gap spacing to each other.
- 5 19. Method according to any of claims 1 to 18, where after a particular number of segmented pressing plates, a line pressure is generated to expel pinholes and bubbles from the plastics matrix, in each case by means of a impression cylinder.
- 10 20. Method according to any of claims 1 to 19, where the multilayer fibre web is guided through one or more impression cylinders arranged in the continuous press whereby the multilayer fibre web undergoes a complete bubble-free impregnation of the fibre structure with the melt-like plastics matrix.
- 15 21. Device for performance of the method according to claim 1, characterised in that the device contains a fibre laying device and following this in-line a continuous press, and the fibre laying device contains several fibre feed units for in-line supply of web-like fibre structures and one or more matrix feed units connected between or after the fibre feed units for the supply of
- 20 the matrix starting material onto exposed layers of the fibre structure.
22. Device according to claim 21, where the matrix feed unit is a powder scatterer by means of which a matrix starting material which is present in
- 25 powder form is scattered onto exposed layers of the fibre structure.
23. Device according to any of claims 21 to 22, where the matrix feed unit is a film feed unit by means of which a film-like matrix starting material is applied to exposed layers of the fibre structure.
- 30 24. Device according to any of claims 21 to 23, where the fibre laying device contains one or more pressing stations, in particular impression cylinders, by means of which the multilayer fibre web is pre-pressed in-line.

25. Device according to any of claims 21 to 24, where the pressing station comprises a contact roller and an impression roller arranged in pairs and between which the multilayer fibre web is passed under a pressure.
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26. Device according to one of claims 21 to 25, where the pressing station is part of a fibre feed unit and the contact roller serves simultaneously for unfolded feed and deflection of a web-like fibre structure in the advance direction.
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27. Device according to any of claims 21 to 26, where at least one fibre feed unit is designed as a cross layer by means of which web-like fibre structure can be supplied obliquely or diagonally in the advance direction of the multilayer fibre web and folded to form laying edges.
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28. Device according to any of claims 21 to 27, where alternately a fibre feed unit for unfolded supply of a web-like fibre structure in the advance direction of the fibre web and a subsequent fibre feed unit with cross layer for the supply of a web-like fibre structure obliquely or diagonally to the advance direction of the fibre web is present, where the first and last fibre feed unit is for unfolded supply of a web-like fibre structure in the advance direction of the fibre web.
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29. Device according to any of claims 21 to 28, where after each fibre feed unit with cross layer is arranged a matrix feed unit.
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30. Device according to any of claims 21 to 29, where the continuous press contains several separately adjustable pressing zones and tempering zones and the pressing zones, to exert the pressure, contain floating hydraulically activated lower pressing plates which work against an upper rigid pressing construction.
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31. Device according to any of claims 21 to 30, where the pressing zones have segmented pressing plates with adjustable gap spacing to each other.
- 5 32. Device according to any of claims 21 to 31, where after every particular number of segmented pressing plates is arranged a pressing station, in particular a impression cylinder, to generate a linear pressure.